



Warsaw, 9.05.2025

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Review

of the doctoral dissertation by Mr. Anuphat Thirakulwanich
entitled *Drivers of Green Innovation Management Adoption in SMEs:
Evidence from Poland and Thailand*
Supervised by: Assoc. Prof. Sebastian Kot, PhD

I Subject, Formal and Legal Basis for the Preparation of the Review

The subject of this review is the doctoral dissertation of Mr. Anuphat Thirakulwanich entitled *Drivers of Green Innovation Management Adoption in SMEs: Evidence from Poland and Thailand*, prepared under the supervision of Assoc. Prof. Sebastian Kot, PhD.

The reviewed dissertation comprises a total of 227 pages and consists of the following elements:

- Title pages and declarations – 4 pages
- Table of contents – 3 pages
- Introduction – 9 pages
- Main body composed of five chapters – 153 pages
- Conclusion – 3 pages
- References – 296 items
- List of Tables and Figures, six Appendices
- Summary in English and Polish

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The formal basis for this review is a letter from the Dean of the WSB University, Prof. Katarzyna Szczepańska-Woszczyzna, PhD, dated April 11, 2024, appointing me as a reviewer of Mr. Anuphat Thirakulwanich's doctoral dissertation.

The legal grounds for the preparation of this review are set out in Article 190 of the Act of 20 July 2018 – Law on Higher Education and Science (Journal of Laws of 2018, item 1668, as amended), and for the evaluation of the doctoral dissertation – in Article 187, sections 1–4 of the same Act.

Accordingly, the aim of this review is to assess whether Mr. Anuphat Thirakulwanich's dissertation meets the statutory requirements for a doctoral thesis, specifically:

- whether it demonstrates the PhD Candidate's general theoretical knowledge in the discipline of management and quality sciences;
- whether it proves the PhD Candidate's ability to independently conduct scientific research;
- whether it constitutes an original solution to a scientific problem, or an original application of research findings in the economic or social sphere.

II. General Opinion and Evaluation Outcome

The doctoral dissertation of Mr. Anuphat Thirakulwanich, entitled *Drivers of Green Innovation Management Adoption in SMEs: Evidence from Poland and Thailand*, presents a properly designed and independently executed research project, grounded in a current and relevant managerial problem, namely, the implementation of green innovations in the small and medium-sized enterprise sector. The Author addresses a subject of evident practical relevance and substantial cognitive value, constructing a comparative approach that encompasses two markets with distinct institutional and cultural contexts.

The adopted research framework and the applied analytical methods are consistent with the standards upheld in the discipline of management and quality sciences. The theoretical model is based on well-established concepts, and the selected methodology, despite certain limitations, has been implemented competently, enabling the generation of coherent and valuable findings.

In the following sections of this review, I present a detailed evaluation of the various components of the dissertation, which collectively justify my conclusion that the work meets the statutory requirements for doctoral theses. Based on my overall assessment, I recommend that the dissertation be admitted to public defense.

III. Detailed Evaluation

1. Evaluation of the Dissertation Topic and Research Problem

The subject of Mr. Anuphat Thirakulwanich's doctoral dissertation, *Drivers of Green Innovation Management Adoption in SMEs: Evidence from Poland and Thailand*, falls within the discipline of management and quality sciences. The topic is both current and significant from academic and practical perspectives, and aligns well with global trends related to sustainable development and business innovation.

Mr. Thirakulwanich's identifies the research gap as follows: "the management context-specific insights are limited, hindering the development of targeted strategies and initiatives," pointing to an insufficient exploration of green innovation management in SMEs in Poland and Thailand. While I agree with this general statement, I must point out that the dissertation does not provide robust evidence to support the claim, for example, through bibliometric analysis or abstract reviews (a search of the Scopus database reveals over 500 articles affiliated with Poland in the area of green or eco-innovation, including more than 100 based on research conducted in Poland – it should be commented here).

This omission, however, does not invalidate the existence of the research gap indicated by the Candidate. It is indeed a relatively underexplored area, and given the turbulent nature of recent changes, especially in recent years, it requires continuous re-examination and empirical updates.

It must be emphasized that the originality of the chosen topic lies primarily in the comparative analysis of factors influencing the adoption of green innovation management in SMEs across two countries with distinct cultural and economic contexts.

In conclusion, the research problem addressed in the dissertation is timely and relevant. The research gap identified by the Candidate is appropriately defined and worth investigating, although it is insufficiently substantiated within the body of the dissertation.

2. Evaluation of the Dissertation Structure

The structure of Mr. Thirakulwanich's doctoral dissertation is, in general, consistent with conventions typical for the discipline of management and quality sciences and includes all essential components, although their sequence is not entirely intuitive.

The Candidate presents the background of the research problem, the research gap, as well as the main research objective, specific objectives, and hypotheses in a section titled *Introduction*. He also outlines the overall structure of the dissertation in this section, which is appropriate given the chosen research approach, namely, explaining the research context prior to introducing the theoretical framework. This is likely due to the fact that the research

gap was defined primarily through contextual differentiation (a cross-country comparison) and only secondarily through the phenomenon itself (drivers of green innovation management adoption). I find this solution justified and internally coherent with the design of the study.

Subsequent parts of the dissertation discuss the phenomenon of green innovation in SMEs in the context of Poland and Thailand, followed by the presentation of the theoretical framework and development of research hypotheses. The following chapters cover the research methodology, presentation of findings, interpretation of results, and a discussion with recommendations. The entire work is summarized in the *Conclusions* section.

However, it should be noted that the dissertation does not include a separate chapter explicitly dedicated to the literature review. Elements of the literature review are scattered across various chapters. This fragmented structure makes it difficult to clearly identify the current state of research and to locate theoretical sources, especially when evaluating the completeness of the literature coverage.

In conclusion, I do not raise any fundamental objections regarding the overall structure of the dissertation. Its layout is logical, aligned with the adopted research approach, and appropriate to the subject matter. Nonetheless, in terms of literature presentation, a more systematic arrangement and the inclusion of a dedicated section would have been advisable.

3. Evaluation of the Literature Review and Theoretical Framework

In the *Introduction* section, the Author presents four research questions (RQ1–RQ4), covering the entire dissertation including the literature review. This is followed by the formulation of the main research objective: *“The main objective was to find out the drivers that influence the green innovation management in SMEs, under a case of Poland and Thailand.”* This objective is clearly aligned with the scope of the dissertation and is situated within a comparative context. It is further developed through four specific research objectives (RO1–RO4), each directly corresponding to one of the research questions. These objectives respectively address cross-country differences, determinants of green innovation adoption, the role of environmental standard compliance, and practical recommendations. Although the decision to state the research questions before the main objective is not typical, this reversed order does not affect the internal logical consistency of the work.

The dissertation also includes eight research hypotheses (H1–H8), which are formulated later in the work based on the literature review. The hypotheses are logically linked to the stated research objectives and address the corresponding research questions. However, there is a noticeable absence of a hypothesis regarding the comparison of models between the two countries, despite the fact that such comparative analysis is indeed conducted.

As previously noted, the literature review is fragmented across various chapters. While this structure is sometimes applied in academic writing, it reduces clarity and hinders the ability to assess the completeness and coherence of the theoretical argumentation.

The Candidate refers to a wide array of literature, including journals on green innovation, sustainable management, and technology adoption, and includes references to Polish-affiliated research (though, as I noted earlier, this is not sufficiently evidenced). The dissertation also references relevant institutions and green innovation policies in different countries.

The theoretical framework is based on two well-established concepts: the Natural Resource-Based View (NRBV) and the Triple Bottom Line (TBL). This choice is well justified, NRBV modifies the classic resource-based view to include environmental considerations, while TBL offers a multidimensional perspective that integrates economic, social, and environmental aspects. The Candidate uses these theories as the basis for constructing a model of factors influencing green innovation management adoption, which constitutes a substantive contribution. However, some ambiguity arises concerning the relationship between the theoretical foundations and the derived constructs. The Candidate gives only a cursory overview of the foundational assumptions of NRBV as formulated by Stuart Hart, relying instead on various secondary interpretations of the theory. The proposed model is based on the NRBV assumption that *“key resources and capabilities affect the ability of the firm to sustain its competitive advantage”* (Hart, 1995). Table 2.1 in the theoretical chapter is, as I understand, intended to show which variables in the model are derived from the components of each theory. Although this table is formally organized, it introduces some confusion. While the TBL framework is represented comprehensively (social, environmental, and economic bottom lines), the NRBV elements appear only partially and their alignment with the constructs is unclear. The Candidate cites other researchers, but since the table synthesizes their approaches, it should have included a more detailed explanation of how the selected variables correspond to the assumptions of both theories.

In summary, the literature review is dispersed and narrative in character, but it does provide a rationale for the research gap and the general structure of the conceptual model. The theoretical framework has been appropriately selected. However, the logic underlying the derivation of the conceptual model from the TBL and NRBV theories is explained too briefly and requires clarification. Nevertheless, I have no doubt that the hypotheses are robustly derived from previous research and that the model is logically coherent and empirically testable.

4. Evaluation of the Research Methodology and Conducted Analyses

The research methodology presented in the dissertation is, overall, properly designed and implemented, consistent with the quantitative research paradigm and the requirements for causal studies in management sciences. The Author does not formulate a separate research aim or research questions at this stage but reiterates the specific objectives. The study is based on classical covariance-based structural equation modeling (CB-SEM), conducted using SPSS-AMOS v26. The Author correctly defined the latent constructs, derived the theoretical model, and developed a measurement instrument for its empirical validation. The choice of AMOS as an analytical tool is appropriate, considering the model's multidimensionality and the targeted sample size.

The sample size was determined methodically using Cochran's formula. Ultimately, the planned sample size was exceeded (Poland: 428; Thailand: 413 valid responses), which strengthens the foundation for statistical inference. However, the use of convenience sampling may limit the generalizability of the findings—though it is a methodologically acceptable practice in research on SMEs.

The questionnaire was constructed based on the subject literature. In Table 3.1, the Author indicates theoretical sources for the sets of indicators corresponding to the latent constructs. While the citations are somewhat general and do not allow for easy identification of the original scales for each indicator, it may be assumed that the constructs are grounded in the literature. For content validation, the Author conducted an expert evaluation involving six specialists from Poland and Thailand, using the Item-Objective Congruence (IOC) procedure, which is a notable strength of the study.

The dissertation employs contextual triangulation through data collection in two countries (Poland and Thailand), allowing for the identification of institutional and cultural differences. Additionally, the Author applied triangulation of analytical indicators to assess construct reliability and validity: Cronbach's alpha, Composite Reliability, AVE, Fornell-Larcker criterion, and a set of model fit indices (Table 3.4). All values meet quality standards. Although the data are derived solely from a quantitative survey, the inclusion of an expert panel for questionnaire validation serves as a third component reinforcing the study's methodological robustness. There is, however, no mention of a pilot study.

The Author declares that participation in the study was anonymous and voluntary, and that respondents were informed about the study's purpose and scope. No personal data were collected, and ethical standards were upheld; hence, the procedures followed can be considered sufficient and consistent with good research practice.

In operationalizing the constructs, the Candidate chose to aggregate scale items, likely by computing mean scores. This approach (parceling) is common in such analyses, but in this case it further reduced the number of observable variables to only two or three per construct. This resulted in saturated measurement models with zero degrees of freedom ($df = 0$) for the constructs, which the Author acknowledges. While such models are technically free of fit error

($\chi^2 = 0$; CFI = 1), they preclude empirical assessment of measurement quality and limit the statistical evaluation of convergent and discriminant validity. Nevertheless, content validity was ensured, as previously mentioned, through the panel evaluation of the observable variables composing each construct. Thus, descriptive validity was satisfied at the conceptual stage. Furthermore, the Author conducted a second-order CFA, confirming the statistical fit of the overall model.

Despite the aforementioned limitations, the structural part of the SEM, based on theoretically justified relationships among constructs with content validity confirmed by experts, provides valuable insights in my view—particularly through the MGA comparative analysis between models for Poland and Thailand, which confirmed the existence of some differences. Ultimately, the model allows for hypothesis testing and reveals the relative strength of specific determinants, thus enhancing the study's cognitive and practical implications. It is good practice to report model fit indices directly below the model rather than in an appendix. A consolidated summary of the hypothesis verification results is also missing—an additional column in Tables 4.28 and 4.29 would have been helpful. Moreover, the Author often avoids directly stating whether a hypothesis is confirmed or rejected, instead offering interpretations of test results, at times inelegantly, for example: *“The results indicated that green regulation management (GRM) has a positive and insignificant effect on the adoption of green innovation management”* (p. 149). Aside from the awkward syntax (a more accurate phrasing would be “positive but insignificant”), the expression “positive and insignificant” essentially means “insignificant,” which should have been clearly reported as the rejection of the hypothesis.

The Author conducted a discussion of the findings, though it remains somewhat formulaic. The significance of each variable's effect is discussed individually for each country and compared with findings from other researchers, presumably in other market contexts, which, unfortunately, are not explicitly referenced. At the end, based on the MGA results, the Author compares the two markets. However, the discussion lacks depth. Both theoretical and practical implications are addressed later in the dissertation. The limitations are acknowledged appropriately, although in my opinion not comprehensively. The Author fails to reflect on the limitations related to the sampling method, the use of saturated measurement models, or the weak model fit for the Polish sample.

In conclusion, despite the identified shortcomings, I consider the methodological section to be reliable, consistent, and sufficiently robust to support the interpretation of the results as a valuable empirical contribution.

5. Evaluation of Formal Aspects and Literature

The dissertation is written in academic language, using terminology appropriate for the field of management sciences. It meets general formal requirements, although several shortcomings should be noted that diminish its overall clarity.

First, the text contains unnumbered subheadings that are not listed in the table of contents. Their inclusion using a three-level numbering system (e.g., *Awareness and Training Programs*, *Financial Incentives*) would have improved navigation throughout the document. Not all subheadings are problematic, those consisting of only a single paragraph (e.g., *First Order CFA:...*) should rather be incorporated as part of broader sections instead of being treated as standalone subheadings.

The numbering of tables is also somewhat confusing. There are instances in which tables appear out of numerical order (e.g., Table 4.1, 4.3, 4.5, followed by 4.2 and 4.4; or Table 4.18, 4.20, 4.17, 4.19, 4.21).

Several tables, especially those presenting measurement scale items (notably in Chapters 3 and 4), exhibit poor typographic quality, lacking adequate line spacing, which makes them difficult to read, particularly when the number of items is high. These tables appear cramped and visually overloaded, which negatively affects reading comfort and data legibility.

Figures and diagrams, including key SEM models, are functionally adequate but lack graphical consistency and refinement. For example, Figure 2.8 (Conceptual Framework) includes unnecessary color elements that neither enhance clarity nor serve a clear analytical purpose. In other figures (e.g., Figure 4.17, 4.20), there is a lack of consistent style, misalignment of axes, and overall typographic standards that would be expected in academic visual design.

In terms of literature selection, the Author refers to up-to-date and reputable international sources representing both theoretical perspectives on environmental management and recent empirical studies. The reference list includes a total of 296 sources.

6. Conclusion

Mr. Anuphat Thirakulwanich's doctoral dissertation possesses several notable strengths that merit emphasis. Most importantly, it addresses a socially and scientifically relevant topic concerning the management of green innovations in the SME sector, aligning with the global discourse on sustainable development. A particularly original and valuable aspect of the work is the comparative analysis of two countries, Poland and Thailand, that differ institutionally and culturally. The Author presents a logically constructed research design in which the research questions, objectives, and hypotheses are clearly and coherently linked. The research methodology is well planned and executed, including contextual triangulation, expert validation of measurement instruments (IOC), and the application of classical SEM using the

AMOS software environment, which is methodologically sound given the sample size. A significant strength of the dissertation is the use of Multi-Group SEM analysis, which adds considerable comparative value to the study's findings.

At the same time, there are several important weaknesses that reduce the evidentiary strength and clarity of the work. Chief among these is the relatively weak documentation of the research gap through the literature review, particularly the lack of convincing evidence supporting the underexplored nature of the Polish context. The literature review is fragmented and lacks a systematic character, and the integration of the theoretical frameworks (TBL and NRBV) is handled superficially, requiring clarification especially regarding how theory components relate to the model constructs. The dissertation lacks an explicit hypothesis addressing cross-country differences, even though such analyses were conducted and constitute a valuable aspect of the research. There is also no consolidated summary of hypothesis test results. Finally, formal shortcomings such as inconsistent table numbering, dense and visually unclear table layouts, lack of subheading numbering, and aesthetic imperfections in figures diminish the editorial quality of the dissertation. These shortcomings should serve as a source of reflection for the Candidate and guide future academic and publication work.

III. Questions for the Candidate

1. In your dissertation, you refer to two theoretical frameworks: the Triple Bottom Line (TBL) and the Natural Resource-Based View (NRBV). Please explain how you integrated the pillars of TBL with the components of NRBV when constructing the model variables. Why did you choose to apply these two particular theories instead of, for example, the ESG framework?
2. Was a pilot study conducted? If not, please explain the rationale behind this decision.
3. Why did you not include qualitative research involving SMEs? Do you see any potential added value such qualitative research might offer in relation to your research objective?
4. In your work, you indicate significant differences in the role of specific factors between Poland and Thailand. Based on the results of your comparative analysis, please summarize what actions you would recommend to institutions supporting SMEs in each of these countries in order to effectively address these differences in policies promoting green innovation management in SMEs. Do you perceive more barriers or more opportunities for implementing such initiatives?
5. To what extent do you believe the results of your study can be generalized to other countries? For which countries might the results from Poland, and for which those

from Thailand, serve as useful analogies? What limitations in this regard do you identify?

IV. Final Recommendation

Based on the detailed evaluation presented in this review, I conclude that Mr. Anuphat Thirakulwanich's doctoral dissertation entitled *Drivers of Green Innovation Management Adoption in SMEs: Evidence from Poland and Thailand* meets the statutory requirements for doctoral theses, particularly with respect to scientific independence, methodological soundness, and the introduction of original contributions to the ongoing discourse in the area of green innovation management. Considering the overall assessment of the dissertation, I recommend that it be admitted to public defense.